REMARKS

Applicants note the filing of an Information Disclosure Statement herein on August 21, 2003 and note that an initialed copy of the PTO/SB/08A was returned with the outstanding Office Action. Applicants note that only one page of PTO/SB/08A was submitted; therefore, all sheets have been initialed and returned.

The Final Office Action mailed September 27, 2005, has been received and reviewed. Claims 1 through 15, and 38 through 45 are currently pending in the application. Claims 1, 5 through 15, and 38 through 45 stand rejected. Claims 2 through 4 have been allowed. Applicants propose to amend claim 1 and respectfully request reconsideration of the application as proposed to be amended herein.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Publication No. 2002/0066523 A1 to Sundstrom, *et al.*, in view of U.S. Patent No. 6,610,560 to Pu, *et al.*

Claims 1, and 7 through 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sundstrom, *et al.*, U.S. Publication No. 2002/0066523 A1 (hereinafter "Sundstrom") in view of Pu, *et al.*, U.S. Patent No. 6,610,560 (hereinafter "Pu"). Applicants respectfully traverse this rejection, as hereinafter set forth.

> M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:
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> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

Sundstrom provides a "method of using polymer material in the construction of electrical/electronic, mechanical and/or optical assemblies." Col. 1, ¶ 4. As applied to claim 1, Sundstrom teaches a method of forming a bond between a semiconductor device and a substrate

that employs a polymer with low whetting characteristics. In particular, Sundstrom teaches depositing a polymer paste material 14 onto a device bond area 25 and extending onto the polymer mask 24. Pg. 2, ¶¶ 19-22. Conversely, the polymer paste material 14 may be deposited upon a substrate bond area 18 and extending onto the *substrate polymer mask* 16. Pg. 1 – 2, ¶ 15. It must be noted that the polymer mask 16/24 is present in each instance before applying the polymer paste material. The polymer paste material is partially cured to form a polymer bump, after which the device 10 is placed on the substrate 12. Pg. 2, ¶¶ 22-24. The polymer paste material 14 is then fully cured, which causes the surface tension of the polymer paste material to pull the paste into a vertical column and align the device bond area 25 over the substrate bond area 18. Sundstrom also teaches integrating multiple electrical and optical interconnects between a Flip Chip on Board (FCOB) die and a "host" substrate. Pg. 2, ¶ 27. Stated differently, Sundstrom discloses a single device with multiple connections; it does not disclose multiple devices or dice connected to a substrate. In the next sentence, Sundstrom discloses a FCOB device that includes a first FCOB above a substrate and a second FCOB device "on the *backside* of the substrate." Pg. 2, ¶ 27.

Sundstrom, however, fails to teach or suggest a process for reconstructing a semiconductor wafer, comprising, in part, forming at least a first alignment droplet and at least a second alignment droplet from a flowable alignment material at *laterally* spaced locations on a substrate and positioning first and second semiconductor dice on their respective, *laterally* spaced, alignment drops. As mentioned above, Sundstrom discloses a FCOB-Substrate-FCOB assembly, the second FCOB located on the *backside* of the substrate, not at least a first and a second semiconductor die located laterally on a substrate. The Examiner seems to implicitly recognize this point in the Office Action of Sept. 27, 2005, pg. 4, when he states that "Sundstrom does not specify forming an underfill that extends laterally between the first and second dice," which follows because Sundstrom fails to teach or suggest a second die positioned laterally on the substrate.

In addition, Sundstrom fails teach or suggest introducing an underfill material between the surfaces of the first and second semiconductor *dice* to form a reconstructed semiconductor wafer. Sundstrom provides for a *substrate polymer mask* 16, Pg. 1 – 2, ¶ 15, not underfill

material; the polymer mask simply masks selected areas of the substrate/die from whetting to the polymer paste. Pg. 1, ¶ 6. In addition, Sundstrom describes in length that the invention uses chemical vapor deposition (CVD) to deposit the polymer mask material and the benefits that the CVD process provides. Pg. 2, ¶ 25. Applicants note that the polymer mask is *preplaced*, before any assembly of a die and a substrate is effected. Nonetheless, the Examiner asserts that the polymer mask is underfill; however, Applicants are claiming a method, not a material *per se*. To establish a *prima facie* case of obviousness, the reference "must expressly or impliedly suggest the claimed invention or the *examiner must present a convincing line of reasoning* as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972 973 (Bd. Pat. App. & Inter. 1985); M.P.E.P. § 2142 (emphasis added). "A statement that modification of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' ...is not sufficient to establish a *prima facie* case of obviousness." *See Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); M.P.E.P. § 2143.01 (emphasis in original). Applicants respectfully assert that the Examiner fails to provide a convincing line of reasoning as to why one skilled in the art would view the expressly stated polymer mask and its deposition by CVD as *introducing* an underfill material *between the surfaces of the first and second semiconductor dice and the substrate* as claimed, or the equivalent thereof. The claim language as written presupposes that the dice are placed before the underfill material is introduced *between* the dice and the substrate, which method sequence would render the use of a CVD deposition method inoperable.

Pu, which the Examiner asserts remedies the deficiencies of Sundstrom, fails to do so. Pu provides a "new semiconductor packaging technology for fabrication of [Chip-On-Chip] COC-based multi-chip module with molded underfill." Col. 3, lines 3-5. The purpose of the invention is to "help prevent the bonding wires from breaking during TCT or TST testing procedures." Col. 3, line 6-7. Pu teaches a substrate 200 with a first semiconductor chip 210 whose inactive surface 210b is adhered to the front surface 200a of substrate 200. Col. 4, lines 4-8. The active surface 210a of chip 210 is wirebonded to the substrate 200. Col. 4, lines 8-10. A second semiconductor chip 220 and a third semiconductor chip 230 are each bonded to the active surface

210a of chip 210 "through COC technology by means of an array of solder bumps." A molding material 260 is injected under the gap 222 between chip 220 and chip 210 and the gap 232 between chip 230 and chip 210. Col. 4, lines 45-55. By so doing, the invention achieves molded underfill for a *COC-based module*. Col. 4, line 54-55 (emphasis added). "Through the foregoing process, an encapsulation body 270 is formed to encapsulate all the semiconductor chips 210,220, 230 over the circuited substrate 200." Col. 4, lines 56-59.

Pu, however, fails to teach or suggest introducing an underfill material to form a reconstructed wafer. The underfill in Pu forms a semiconductor packaging technology for a COC-based multi-chip module, which can help prevent the bonding wires from breaking during testing. Col. 3, lines 3-6. The COC-based multi-chip module is a chip scale package (CSP) rather than a semiconductor wafer. Thus, Pu fails to remedy Sundstrom's deficiencies, particularly that of forming a reconstructed semiconductor wafer, among others. Therefore, Pu and Sundstrom do not teach or suggest all of the claim limitations of amended independent claim 1 and the withdrawal of the 35 U.S.C. § 103(a) rejection is respectfully requested.

With respect to Examiner's argument vis-à-vis the reconstructed semiconductor wafer, Applicants recognize that "[a] reference may be relied upon for all that it would have *reasonably* suggested to one having ordinary skill in the art, including nonpreferred embodiments." *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804 (Fed. Cir. 1989); M.P.E.P. § 2123 (emphasis added). However, to establish a *prima facie* case of obviousness, the references "must expressly or impliedly suggest the claimed invention or the *examiner must present a convincing line of reasoning* as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972 973 (Bd. Pat. App. & Inter. 1985); M.P.E.P. § 2142 (emphasis added). Following this reasoning, "[a] statement that modification of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' ...is not sufficient to establish a *prima facie* case of obviousness." *See Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); M.P.E.P. § 2143.01 (emphasis in original). The Examiner asserts that "the invention of Sundstrom shown in FIG. 7...may be interpreted to be a 'reconstructed wafer." Office Action of Sept. 27, 2005, pg. 12. Applicants, however, respectfully disagree, and point

out that the Examiner fails to "present a convincing line of reasoning as to why the artisan would have found" forming a reconstructed semiconductor wafer obvious from the two references, Sundstrom and Pu, that expressly teach chip scale packages. Therefore, the Examiner fails to establish a *prima facie* case of obviousness and the withdrawal of the 35 U.S.C. § 103(a) rejection of amended independent claim 1 is respectfully requested.

In addition, even if Pu remedied each of the deficiencies in Sundstrom, which Applicants do not concede, "the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination." *In re Mills*, 916 F. 2d 680 (Fed. Cir. 1990); M.P.E.P. § 2143.01. The examiner asserts that the motivation to combine the references may be found in Pu, which states that the molded underfill can help prevent the bonding wires from breaking during TCT [Temperature Cycle Test] or TST [Temperature Shock Test] testing procedures. Col 3, lines 4-6; Office Action of Sept. 27, 2005, pg. 5. Pu illustrates these bonding wires 111 in FIGs. 1A-1D that are susceptible to breaking during the tests. Col. 2 lines, 36-43. Sundstrom, however, fails to teach or suggest bonding wires similar to those that are the subject of the inventive aspects of Pu, which fatally weakens the Examiner's alleged motive to combine the references. Hence, the only suggestion or motivation to combine the references apparently derives from the specification. Because the only suggestion or motivation to combine the references apparently derives from the specification, the withdrawal of the 35 U.S.C. § 103(a) rejection of amended independent claim 1 is respectfully requested.

The 35 U.S.C. § 103(a) obviousness rejections of claims 7-10 are improper because they each depend, either directly or indirectly, from allowable independent claim 1, among other reasons. *See In re Fine*, 5 USPQ 2d 1596, 1600 (Fed. Cir. 1988); M.P.E.P. § 2143.03. Therefore, the withdrawal of the 35 U.S.C. § 103(a) rejection of claims 7-10 is respectfully requested.

Claim 9 is additionally allowable because neither Sundstrom nor Pu teaches or suggest introducing an underfill material between the first and second semiconductor dice and the substrate in the form of a fixture plate.

Obviousness Rejection Based on U.S. Publication No. 2002/0066523 A1 to Sundstrom, *et al.*, in view of U.S. Patent No. 6,610,560 to Pu, *et al.*, as applied to claims 1, 7-10 above, and further in view of U.S. Publication No. 2003/0164555 A1 to Tong, *et al.*

Claims 5 and 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sundstrom, in view of Pu, as applied to claims 1, 7-10 above, and further in view of Tong, *et al.*, U.S. Publication No. 2003/0164555 A1 (hereinafter "Tong"). Applicants respectfully traverse this rejection, as hereinafter set forth.

The 35 U.S.C. § 103(a) obviousness rejections of claims 5-6 are improper because they each depend, either directly or indirectly, from allowable independent claim 1, among other reasons. *See In re Fine*, 5 USPQ 2d 1596, 1600 (Fed. Cir. 1988); M.P.E.P. § 2143.03. Therefore, the withdrawal of the 35 U.S.C. § 103(a) rejection of claims 5-6 is respectfully requested.

Claim 6 is additionally allowable because Tong fails to remedy the deficiency that neither Sundstrom nor Pu teaches or suggests a method of inducing an alignment droplet to at least partially solidify comprising reacting the alignment material with an activating agent to at least partially solidify the alignment droplet. Tong discloses an underfill encapsulant material that is used with an unfilled epoxy/phenolic material that is combined with an imidazole/anhydride adduct. Pg. 5, ¶ 30. The Applicants respectfully disagree with the Examiner's assertion that the imidazole/anyhydride is an activating agent to at least partially solidify the alignment droplets. Office Action of Sept. 27, 2005, pg. 6. Tong states that the imidazole/anhydride is a catalyst that, with an epoxy and solvent, "produces an underfill having an onset curing temperature well above 150°C and a cure peak temperature above 183°C." Pg. 3, ¶ 19. Continuing, Tong states that the "latent catalyst, the adduct of anhydride and imidazole, is used in the composition to ensure the proper cure of the composition without interfering with the formation of the interconnection. The catalyst chosen *must prevent* any curing, other than some minimal pre-curing, during the B-stage." Pg. 2, ¶ 13 (emphasis added). Thus, the underfill compound disclosed in Tong requires that it be heated for it to solidify; the imidazole/anhydride of Tong does not cause the underfill to solidify, it only modifies the temperature to which it must be heated before it solidifies.

Moreover, claims 5 and 6 are further allowable because there is no motivation or suggestion to combine Tong with Sundstrom, in view of Pu. The Examiner asserts that one skilled in the art would be motivated to combine Tong with Sundstrom and Pu because Tong provides minimal solvent. Office Action of Sept. 27, 2005, pg. 6. Applicants respectfully disagree and point out that the Examiner elides the beginning part of the sentence which states, "The *underfill* encapsulant must be B-stageable, which means the *underfill* must be solidified after its placement on a wafer to provide a smooth, non-tacky coating with minimal residual solvent." Pg. 1, ¶ 8 (emphasis added). Such a statement might provide a motive or suggestion to combine the references *if* the disclosure in Tong were to be used for underfill in Sundstrom, in view of Pu. However, the Examiner suggests that the underfill in Tong is suitable as an alignment droplet, despite the fact that Tong fails to teach or suggest the underfill being used as an alignment droplet. While it is true that Tong discloses an unfilled epoxy/phenolic material combined with an imidazole/anhydride adduct that incidentally performs an alignment function, it does so in the context of a test in which the 'drop' of unfilled epoxy/phenolic was sufficiently large to form a complete fillet around a 25 mm x 25 mm cover slip, not as an alignment drop for a semiconductor die. Pg. 5, ¶ 30. Further, Tong does not disclose whether this unfilled epoxy/phenolic would have the same, assertedly desirable residual properties as the underfill, which differs chemically from the unfilled epoxy/phenolic. *Compare* Example 1, pg. 4, ¶ 28 and Example 3, pg. 5, ¶ 30. Therefore, Tong fails to teach or suggest the suitability of the unfilled epoxy/phenolic material that is combined with an imidazole/anhydride adduct as an alignment droplet in conjunction with an alignment cavity in a die surface. Although Tong 'may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." *In re Mills*, 916 F.2d 680, 682 (Fed. Cir. 1990); M.P.E.P. § 2143.01. Tong, however, fails to provide a suggestion or motivation to combine the reference with Sundstrom and Pu without impermissibly relying upon Applicants' own disclosure. Therefore, the prior art provides no motivation or suggestion to combine the references as attempted by the Examiner.

In consideration of the foregoing arguments, claims 5 and 6 are allowable and the withdrawal of the 35 U.S.C. §103(a) rejection is respectfully respected.

Obviousness Rejection Based on U.S. Publication No. 2002/0066523 A1 to Sundstrom, *et al.*, in view of U.S. Patent No. 6,610,560 to Pu, *et al*,. as applied to claims 1, 7-10 above, and further in view of U.S. Patent No. 6,013,534 to Mountain

Claims 11 through 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sundstrom, in view of Pu, as applied to claims 1, 7-10 above, and further in view of Mountain, U.S. Patent No. 6,013,534 (hereinafter "Mountain"). Applicants respectfully traverse this rejection, as hereinafter set forth.

Sundstrom and Pu, as set forth above, fail to teach and suggest all of the claim limitations of independent claim 1, including, among others, introducing an underfill to form a reconstructed semiconductor wafer. Mountain, Applicants respectfully point out, fails to remedy the deficiency in introducing an underfill to form a reconstructed semiconductor wafer, among others.

With respect to Examiner's argument vis-à-vis the reconstructed semiconductor wafer, Applicants recognize that "[a] reference may be relied upon for all that it would have *reasonably* suggested to one having ordinary skill in the art, including nonpreferred embodiments." *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804 (Fed. Cir. 1989); M.P.E.P. § 2123 (emphasis added). However, to establish a *prima facie* case of obviousness, the references "must expressly or impliedly suggest the claimed invention or the *examiner must present a convincing line of reasoning* as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972 973 (Bd. Pat. App. & Inter. 1985); M.P.E.P. § 2142 (emphasis added). Following this reasoning, "[a] statement that modification of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' ...is not sufficient to establish a *prima facie* case of obviousness." *See Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); M.P.E.P. § 2143.01 (emphasis in original). The Examiner asserts that "the invention of ...Mountain shown in FIGs. 6-7...may be interpreted to be a 'reconstructed wafer." Office Action of Sept. 27, 2005, pg. 12. Applicants, however, respectfully disagree, and point out that the Examiner fails to "present a convincing line of reasoning as to why the artisan would have found" introducing an underfill to form a reconstructed semiconductor wafer obvious

from a top view of a wafer (FIG. 6 – a side (sic) view of the handle wafer with the first transfer wafer bonded thereto so that the dice are within the window of the template wafer) and a schematic that includes the phrase "Thinned Dice and Template Wafer" and "Handle Wafer" (FIG. 7). Even when consulting the specification, Applicants respectfully point out that Mountain discusses "the first step of the method is to acquire a semiconductor wafer...referred to as a handle wafer," (Col. 4, lines 63-64), "a second semiconductor wafer, hereinafter referred to as a template wafer, is obtained," (Col. 5, lines 14-16), and "a third semiconductor wafer, hereinafter referred to as a transfer wafer, is obtained." Col. 6, lines 45-47. As the text expressly states, the three semiconductor wafers in Mountain are obtained, and therefore Mountain fails to teach or suggest forming a reconstructed wafer.

Likewise, Applicants respectfully assert that the Examiner misapprehends the text to which he further cites, stating that "Mountain, Col. 7, lines 61-62, specifies working with an individual die or multiple dice, *i.e.*, wafers." Office Action of Sept. 27, 2005, pg. 12. In full, Mountain states, "The thinned dice sections are packaged as the user desires. Again, each thinned diced section may consist of an individual die or multiple dice." Elided, however, are the preceding sentences from the previous paragraph and the subsequent sentences in the same paragraph that provide context for the cited statement. From the preceding paragraph, Mountain states "the piece of transfer wafer attached to the diced portion is released..." Col. 7, lines 55-56; FIG. 16. All that Mountain leaves at this point are integrated circuits, or dice, not the coherent wafer that the Examiner alleges. The succeeding sentences state, "The package may be an electrical package for receiving the thinned diced portion into the intended end product (*e.g.*, smart-card, multi-chip-module, *etc.*) or it may be a non-electrical package for holding one or more thinned diced portions for storage so that the thinned diced portions may be placed into an electrical package at a later date." Col. 7, lines 62-67; Col. 8, line 1; FIG. 17. Again, Mountain's text is consistent with a reading of individual circuits. In addition, Applicants respectfully point out that the asserted motive to combine the references states that "an object of the present invention [is] to thin semiconductor integrated circuits received in die form of various types without any size or thickness restriction so that all or a portion of the thinned dice may be used together in a multi-chip module." The Examiner, however, fails to provide a convincing line of

reasoning as to why one skilled in the art would view the stated object of the invention and the cited lines above as teaching or suggesting the forming of a reconstructed semiconductor wafer rather than the thinned dice for a multi-chip-module as expressly stated. Therefore, Mountain fails to teach or suggest forming a reconstructed wafer and the reference, when combined with Sundstrom and Pu, fails to establish a *prima facie* case of obviousness.

Considering that a *prima facie* case of obviousness is not established for independent claim 1, the 35 U.S.C. § 103(a) obviousness rejections of claims 11-15 are improper because they each depend, either directly or indirectly, from allowable independent claim 1, among other reasons. *See In re Fine*, 5 USPQ 2d 1596, 1600 (Fed. Cir. 1988); M.P.E.P. § 2143.03. Therefore, the withdrawal of the 35 U.S.C. § 103(a) rejection of claims 11-15 is respectfully requested.

In addition, Sundstrom, Pu, and Mountain provide no motivation or suggestion to combine or modify the references, nor do they provide a reasonable expectation of success. Mountain provides a method of thinning integrated circuits received in *die* form so that the thinned dice may be used together in a multi-chip-module, the alleged motive to combine Mountain with Sundstrom and Pu. Col. 3, lines 1-5; Office Action of Sept. 27, 2005. Even assuming *arguendo*, that Pu and Sundstrom teach all of the limitations of claim 1, which Applicants do not concede, the result is either an FCOB (pg. 2, ¶ 27) or a multi-chip-module (Col. 4, lines 54-55), not the individual integrated circuits in die form at which Mountain is directed. Applicants respectfully assert that the Examiner fails to provide a convincing line of reasoning why Mountain, directed at thinning integrated circuits, suggests to one skilled in the art the desirability to combine it with the a method of forming chip-scale packages as disclosed in Sundstrom and Pu. Likewise, because Mountain is directed at individual integrated circuits received in die form, the references do not provide a reasonable expectation that the disclosed invention would succeed using the chip-scale packages disclosed in Sundstrom and Pu. Thus, absent a convincing line of reasoning, the apparent motive appears to derive from referring to the specification.

Claim 11 is additionally allowable because Sundstrom, Pu, and Mountain each fail to disclose singulating semiconductor dice from a reconstructed semiconductor wafer as fabricated

by Applicants.

Claim 12 is additionally allowable because Sundstrom, Pu, and Mountain each fail to disclose singulating semiconductor dice through the process of backgrinding the reconstructed semiconductor wafer to remove the underfill material. Mountain, as discussed above, uses backgrinding to thin individual die; it does not disclose using backgrinding *in singulating* semiconductor dice from a reconstructed wafer. Rather, Mountain discloses singulating the die *with the transfer wafer attached*, the transfer wafer being removed, if at all, at a later time. Col. 7, lines 26-45; Col. 7, lines 55-59. In addition, the material to which the Examiner cites in Mountain is an *adhesive material*, not underfill. Col. 5, lines 41-49; Col. 7, lines 9-14. The functional dice are placed *circuit-side, or face-side,* down on the adhesive layer. Col. 5, line 50-52.

Even presuming that the adhesive could be characterized as underfill, which Applicants do not concede, the Examiner fails to provide a convincing line of reasoning why one skilled in the art would choose backgrinding as a "conventional adhesive removal technique" when the adhesive is applied on the circuit-side of the semiconductor die. Col. 7, line 10; Col. 5, line 50-52. Backgrinding would risk damaging the integrated die, detrimental to the goal of a packaging yield of close to 100%. Col. 7, lines 17-18.

Finally, Applicants respectfully point out that the Examiner uses the previous cited lines from Mountain regarding the adhesive in his argument vis-à-vis claim 15, thus the reference cannot at the same time teach backgrinding a reconstructed semiconductor wafer to remove underfill *and* removing adhesive-coated film following the backgrinding.

Claim 13 is additionally allowable because Sundstrom, Pu, and Mountain each fail to disclose a process of removing a fixture plate adhered to an underfill material by backgrinding the reconstructed semiconductor wafer.

Therefore, claims 11-15 are each allowable and the withdrawal of the 35 U.S.C. § 103(a) rejection is respectfully requested.

Obviousness Rejection Based on U.S. Publication No. 2002/0066523 A1 to Sundstrom, *et al.*, in view of U.S. Patent No. 6,013,534 to Mountain as applied to claims 38-40, 42, and 43 above

Claims 38 through 40, 42 and 43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sundstrom in view of Mountain. Applicants respectfully traverse this rejection, as hereinafter set forth.

Independent claim 38 recites a method of performing wafer-level processing on a number of separate semiconductor devices. The method of claim 38 comprises, among others, underfilling between the positioned semiconductor dice and a substrate having alignment droplets positioned thereon to form a reconstructed semiconductor wafer and performing wafer-level processing on the reconstructed semiconductor wafer. Sundstrom, as discussed above, fails to teach underfilling the positioned semiconductor dice to form a reconstructed wafer. Pg. 1 – 2, ¶ 15. Nonetheless, the Examiner asserts that the polymer mask is underfill, but to establish a *prima facie* case of obviousness, the reference "must expressly or impliedly suggest the claimed invention or the *examiner must present a convincing line of reasoning* as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972 973 (Bd. Pat. App. & Inter. 1985); M.P.E.P. § 2142 (emphasis added). "A statement that modification of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' ...is not sufficient to establish a *prima facie* case of obviousness." *See Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993); M.P.E.P. § 2143.01 (emphasis in original). Applicants respectfully assert that the Examiner fails to provide a convincing line of reasoning as to why one skilled in the art would view the expressly stated polymer mask deposited by CVD as underfill.

Additionally, Sundstrom fails to teach or suggest fabricating a reconstructed semiconductor wafer. At most, as discussed above, Sundstrom teaches fabrication of a FCOB assembly consisting of a substrate with two FCOB devices, not a reconstructed semiconductor wafer. Finally, Sundstrom fails to teach performing wafer level processing on the reconstructed semiconductor wafer.

Mountain, like Sundstrom, also fails to disclose underfilling semiconductor dice positioned by their back sides using alignment drops positioned on a substrate to form a reconstructed semiconductor wafer and merely singulates dice in combination with a portion of a

"transfer wafer" after thinning of the dice.

In addition, and as noted previously, Sundstrom and Mountain provide no motivation or suggestion to combine or modify the references, nor would one skilled in the art reasonably expect to successfully do so. Sundstrom teaches or suggests a plurality of semiconductor dice with alignment vias within the context of a FCOB-Substrate-FCOB assembly. Pg. 2, ¶ 27. Mountain, as discussed above, is directed towards a process of thinning individual semiconductor die, not a method of fabricating a reconstructed semiconductor wafer from individual semiconductor dice and performing wafer level processing thereon. The Examiner asserts that the motive to combine may be found in that an object of Mountain is to thin individual semiconductor dice, Office Action of Sept. 27, 2005, but fails to connect that reason with the observation that Sundstrom discloses a plurality of semiconductor die within the context of a FCOB assembly. Likewise, neither Sundstrom nor Mountain provides a reasonable expectation that combining a chip-scale package with the method of Mountain designed for individual die would succeed. Lacking a motive to combine and a reasonable expectation of success, the only apparent motive appears to derive from impermissible hindsight.

Considering the foregoing arguments, independent claim 38 is therefore allowable and the withdrawal of the 35 U.S.C. § 103(a) rejection is respectfully requested.

The 35 U.S.C. § 103(a) obviousness rejections of claims 39, 40, 42, and 43 are improper because the nonobviousness of independent claim 38 precludes a rejection of claims 39, 40, 42, and 43, which depends therefrom because a dependent claim is obvious only if the independent claim from which it depends is obvious. *See* In re Fine, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988), *see also* MPEP § 2143.03. Therefore, the Applicants request that the Examiner withdraw the 35 U.S.C. § 103(a) obviousness rejection to dependent claims 39, 40, 42, and 43 which depends from allowable independent claim 38.

Claim 43 is additionally allowable because both Sundstrom and Mountain fail to disclose introducing an underfill material between the rear surfaces of semiconductor dice and a surface of the fixture plate.

Considering the foregoing arguments, claims 38-40, 42, and 43 are each allowable and the withdrawal of the 35 U.S.C. § 103(a) rejection is respectfully requested.

Obviousness Rejection Based on U.S. Publication No. 2002/0066523 A1 to Sundstrom, *et al.*, in view of U.S. Patent No. 6,013,534 to Mountain as applied to claims 38-40, 42, 43 above, and further in view of U.S. Publication No. 2003/0164555 A1 to Tong, *et al.*

Claim 41 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Sundstrom in view of Mountain as applied to claims 38-40, 42, 43 above, and further in view of Tong. Applicants respectfully traverse this rejection, as hereinafter set forth.

The 35 U.S.C. § 103(a) obviousness rejections of claim 41 is improper because the nonobviousness of independent claim 38 precludes a rejection of claim 41 which depends therefrom because a dependent claim is obvious only if the independent claim from which it depends is obvious. *See* In re Fine, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988), *see also* MPEP § 2143.03. Therefore, the Applicants request that the Examiner withdraw the 35 U.S.C. § 103(a) obviousness rejection to dependent claim 41 which depends from allowable independent claim 38.

Moreover, claim 41 is further allowable because there is no motivation or suggestion to combine Tong with Sundstrom, in view of Mountain. The Examiner asserts that one skilled in the art would be motivated to combine Tong with Sundstrom and Mountain because Tong provides minimal solvent. Office Action of Sept. 27, 2005, pg. 10. Applicants respectfully disagree and point out that the Examiner elides the beginning part of the sentence which states, "The *underfill* encapsulant must be B-stageable, which means the *underfill* must be solidified after its placement on a wafer to provide a smooth, non-tacky coating with minimal residual solvent." Pg. 1, ¶ 8 (emphasis added). Such a statement might provide a motive or suggestion to combine the references *if* the disclosure in Tong were to be used for underfill in Sundstrom, in view of Pu. However, the Examiner suggests that the underfill in Tong is suitable as an alignment droplet, despite the fact that Tong fails to teach or suggest the underfill being used as an alignment droplet. While it is true that Tong discloses an unfilled epoxy/phenolic material combined with an imidazole/anhydride adduct that incidentally performs an alignment function, it does so in the context of a test in which the 'drop' of unfilled epoxy/phenolic was sufficiently large to form a complete fillet around a 25 mm x 25 mm cover slip, not as an alignment drop for

a semiconductor die. Pg. 5, ¶ 30. Further, Tong does not disclose whether this unfilled epoxy/phenolic would have the same, assertedly desirable residual properties as the underfill, which differs chemically from the unfilled epoxy/phenolic. *Compare* Example 1, pg. 4, ¶ 28 and Example 3, pg. 5, ¶ 30. Therefore, Tong fails to teach or suggest the suitability of the unfilled epoxy/phenolic material that is combined with an imidazole/anhydride adduct as an alignment droplet in conjunction with an alignment cavity in a die surface. Although Tong 'may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." *In re Mills*, 916 F.2d 680, 682 (Fed. Cir. 1990); M.P.E.P. § 2143.01. Tong, however, fails to provide a suggestion or motivation to combine the reference with Sundstrom and Pu without impermissibly relying upon Applicants' own disclosure. Therefore, the prior art provides no motivation or suggestion to combine the references as attempted by the Examiner.

Obviousness Rejection Based on U.S. Publication No. 2002/0066523 A1 to Sundstrom, *et al.*, in view of U.S. Patent No. 6,013,534 to Mountain as applied to claims 38-40, 42, 43 above, and further in view of U.S. Patent No. 6,064,221 to Moden, *et al.*

Claims 44 and 45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sundstrom in view of Mountain as applied to claims 38-40, 42, 43 above, and further in view of Moden, *et al.*, U.S. Patent No. 6,064,221 (hereinafter "Moden"). Applicants respectfully traverse this rejection, as hereinafter set forth.

The 35 U.S.C. § 103(a) obviousness rejections of claims 44 and 45 are improper because the nonobviousness of independent claim 38 precludes a rejection of claims 44-45, which depends therefrom because a dependent claim is obvious only if the independent claim from which it depends is obvious. *See* In re Fine, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988), *see also* MPEP § 2143.03. Therefore, the Applicants request that the Examiner withdraw the 35 U.S.C. § 103(a) obviousness rejection to dependent claims 44-45 which depends from allowable independent claim 38.

Claim 44 is additionally allowable because Sundstrom, Mountain, and Moden fail, individually and in combination, to teach performing a *wafer-level* testing operation on the

reconstructed wafer.

Claim 45 is additionally allowable because Sundstrom, Mountain, and Moden fail, individually and in combination, to teach performing burn-in at the *wafer level* on the reconstructed wafer.

In addition, Sundstrom, Mountain, and Moden provide no motivation or suggestion to combine or modify the references. Moden is directed towards a method of testing and burn-in of individual semiconductor die, not the wafer-level testing of reconstructed semiconductor wafers, and is specifically directed to retaining a die in a single-die, temporary test package. Col. 2, lines 59-65. Any suggestion that the method of Moden is directed to anything other than die is a misapprehension of the disclosure. Likewise, Applicants respectfully point out that none of the references provides a reasonable expectation that the method of die level testing of Moden would succeed on the wafer level, and the Examiner fails to provide a convincing line of reasoning that one having skill in the art would read the references in such a manner. Thus, the motive to combine the references appears to derive from impermissible hindsight. Absent a motive or suggestion to combine the references, independent claims 44-45 are allowable.

Allowed Claims

The Examiner's statement that claims 2-4 are allowed is appreciably noted.

ENTRY OF AMENDMENTS

The proposed amendments to claim 1 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application. Further, the amendments do not raise new issues or require a further search. Finally, if the Examiner determines that the amendments do not place the application in condition for allowance, entry is respectfully requested upon filing of a Notice of Appeal herein.

CONCLUSION

Claim 1-15 and 38-45 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain

which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,

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